Managing Complexity During Military Urban Operations

Visualizing the Elephant

RUSSELL W. GLENN

20041208 138

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DB-430-A

January 2004

Prepared for the United States Army

DB-430-A

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PREFACE

The massiveness of today's largest cities and the complexity of even the smaller urban conglomerations makes the planning and execution of operations within them a significant challenge. There is a call for a construct that makes these tasks manageable. This document proposes such a construct based on two fundamental concepts introduced herein: critical points and density. The two are applicable to virtually any urban undertaking whether the focus is on combat, stability, or support. They pertain to both the tactical and operational levels of war.

The document will be of interest to individuals in the government, nongovernmental organizations, private volunteer organizations, and the commercial sector whose responsibilities include planning, policy, doctrine, training, and the conduct of actions undertaken in or near urban areas in both the immediate future and longer term.

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SUMMARY

This document is a briefing that the author has provided to many audiences in various forms over the past three years. He was privileged in having had the opportunity to do so for the division, corps, and army commanders and staffs preparing to depart for Operation Iraqi Freedom during the closing months of 2002 and January of the following year. The work behind the slides and concepts is, it is hoped, another step forward in the RAND Urban Operations Team's effort to illuminate the complexity, heterogeneity, and vibrancy of urban operations for those given the responsibility to conduct them. The potentially overwhelming complexity and size of 21st-century urban areas compels us to find ways to understand their character and determine how to best allocate available resources in the service of accomplishing objectives. Only the very rare and extraordinarily fortunate organization will have sufficient assets to meet all of the tasks at hand. In such cases, the chances are that the urban area involved is but a town or at most a small city devoid of a robust and capable enemy. Larger cities pose significantly greater challenges. They will tend to demand far more capabilities and resources than those of even the largest of coalitions. The briefing seeks to provide both an understanding of the nature of these challenges and ways to determine where and how to employ what means a commander does have available.

We approach this challenge in two primary steps. The first seeks to provide an overview of the nature of the formidable tasks inherent in urban operations. They include a need to conceptualize the environment in terms of three dimensions—in volume rather than area—for virtually any grouping of manmade structures includes multiple stories, rooms, other enclosures, and, perhaps, underground facilities. The tasks encompass a requirement to adapt quickly and, ideally, to interfere with an adversary's ability to adapt, for rapid adaptation seems to be a characteristic of urban operations; the organization that does it effectively and in a timely manner gains a considerable advantage. Urban contingencies differ not only in the nature of the terrain. Though much of the ambient environment is manmade and poses its own challenges, at least equally as important is the extraordinary (in comparison with other

environments) density of noncombatants. History shows that it is they who tend to suffer the greatest numbers of killed and wounded during combat in their cities, whether from the fighting or from the deprivations of food, potable water, shelter, and medicines that accompany such struggles. They can suffer even in cases in which combat is limited or nonexistent: the close packing of people makes shortages of necessities more quickly felt and acts to speed the spread of disease. It is they who continue to suffer when combat has ceased and the combatants depart, or when the victor leaves the urban area bereft of the functioning infrastructure that its residents depend on for survival.

The second of the two primary steps itself has two components, each a somewhat theoretical but ultimately pragmatic way of approaching the challenges of urban military undertakings. Critical points are first discussed. The author defines these as "points or other elements that could have an extraordinary influence on the achievement of objectives." They include the familiar concepts of center of gravity, decisive points, and additional elements that fit this definition. Critical points can be physical in nature: key buildings, important intersections, or vital streets or highways. Or they can be human: one or more community leaders, heads of family, or those who control one or more significant resources. They can also be components of physical or social infrastructure, or vital events or activities. Urban areas are by nature systems, which are themselves parts of even larger systems. The totality of these many systems can be staggering. The concept of critical points is offered so that those planning and conducting operations in urban areas can identify those nodes and the interrelationships between them that will have the most critical impact on mission success.

While understanding critical points and their interactions helps the comprehension of urban complexity, a second concept, density, provides a means of managing the remaining complexity. The relationship between critical points and density is a symbiotic one. Density, defined herein as "the number of elements per unit space or the quantity of activities per unit time," helps a commander or staff member in his efforts to appropriately select critical points. If there exist very few of a particular urban asset within the urban area of interest (e.g., only one or two water treatment plants in a large urban conglomeration), those assets likely qualify as critical points by nature of their rarity (low density). The same

is probably not true if there is a plethora of these assets. Density further helps a commander determine what assets he needs to accomplish his urban mission and how to allocate them by providing a simple means of viewing the seemingly very complex. Urban areas share many of the characteristics that influence an operation in any environment. They have avenues of approach, potential firing positions, obstacles, lines-of-sight—all familiar to those tasked with accomplishing an assigned mission. Cities, however, differ in that they have a far greater density of many of these elements. Instead of one or two approaches across an open field, cities offer several streets, subterranean passageways, or routes through buildings. Rather than the occasional copse of trees or outcrop of rocks in which a foe could position an ambush, a single urban block might have hundreds of windows, porches, storm drain entrances, or other firing positions. Viewing challenges in terms of densities and overcoming densities provides a means of simplifying the overwhelming. The briefing describes in detail five specific ways of so viewing these challenges:

- match density with density

- effectively reduce densities

- maintain selected densities

- address density asymmetrically

- capitalize on urban densities.

A commander standing atop a high-rise amidst seemingly endless blocks of buildings or one contemplating an overhead photograph of a city housing millions of residents can be forgiven for finding such an environment a daunting one in which to operate. Together the two concepts of critical points and density offer a means to make manageable the chaos.

ACKNOWLEDGMENTS

GLOSSARY

ARVN	Army of the Republic of Vietnam
C^2	Command and Control
CP	Command Post
KIA	Killed in Action
NVA	North Vietnamese Army
OPSEC	Operations Security
PDF	Panamanian Defense Force
PSYOP	Psychological Operations
ROE	Rules of Engagement
T_1 or t	An initial point in time
T_2 or t + 1	A later point in time
TTP	Tactics, Techniques, and Procedures
UCLA	University of California, Los Angeles
VC	Viet Cong

Visualizing the Elephant:
Managing Complexity During Military Urban Operations
Dr. Russell W. Glenn
RAND

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Most readers will be familiar with the parable of the six blind men coming across an elephant for the first time.[1] One blind man touches the elephant's side and declares the beast to be like a wall. A second finds tusk and concludes the animal is akin to a spear. A third, feeling the trunk, declares pachyderm and snake much similar, and so on.

World demographics mean that an increasing number of military personnel will confront the urban elephant. The operation might be one involving combat. Alternatively, it might be a support or stability undertaking in which combat plays little or no part. The situation in either case is similar to that of the blind men. Determining the nature of an urban area's totality and its many physical, social, political, economic, and other components will

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[1]Thought to have age-old Chinese, Indian, and African forms, the most accessible Occidental source is a nineteenth-century poem by American John Godfrey Saxe, "The Blind Men and the Elephant. " The piece is available from a number of sources, though its form may differ slightly depending on which is selected. A small sample of web sites with information on the verse or its background includes *http://www.listproc.bucknell.edu/archives/larryniven-l/200009/msg00887.html*; *http://courses.cs.vt.edu/~cs1104/Introduction/6.blind.men.html*; and *http://www.noogenesis.com/pineapple/blind_men_elephant.html*.

Image from: *http://antwrp.gsfc.nasa.gov/apod/image/0011/earthlights_dmsp_big.jpg*.

require comprehending both whole and parts. It will require the cooperation of many staff members, various headquarters, and representatives from both military and civilian organizations. The key to success will be understanding which parts are most critical, knowing something of the character of those components, and discerning how they influence each other and the workings of the entire built-up area. Unlike the case of the visually challenged six, a military leader can rely on many who have pertinent insights. And, unlike the blind men, the commander begins with a reasonable understanding of the totality. He seeks to identify its most vital parts and how they together influence the whole.

That totality is daunting indeed. Adversary, innocent noncombatant, and friendly soldier are frequently in close proximity to each other. How, then, can a force engage legitimate targets while sparing the innocent? Urban operations tend to be greedy of both manpower and other resources. How can a commander determine where to focus his assets in an operational area consisting of hundreds of buildings with thousands of mobility corridors and tens of thousands of potential enemy hides and firing positions? The following discussion seeks to provide an initial step toward addressing these challenges. It does so in two parts. First, in many cases the sheer expanse of a metropolitan area is impossible to comprehend without a way to coherently analyze the relative importance of its component parts and how they interact. A commander needs to determine at what points to selectively apply available assets; uniform application across the vastness of a modern built-up area guarantees dilution and ineffectiveness. Second, after determining where to focus assets, it is essential to allocate the appropriate resources in the proper quantities. The heterogeneity of urban environments makes such allocations difficult ones. A fundamental physical measure, density, helps to simplify the problem. These two components, critical points and density, are the prime elements for the approach described in the following pages.

A final preliminary note: Though much in these pages employs combat examples for demonstrative purposes, the suggested approaches have equal applicability to support or stability missions in which combat may not play a part. Combat, stability, and support tasks can co-exist both in time and space for any military force

conducting urban operations (other than perhaps units at the lowest tactical levels). While part of a unit fights in one area, demands for control of disturbances or provision of aid to civilians will exist elsewhere. Stability or support missions might also be assigned where no threat of combat exists. Little modification will be necessary when applying the concepts discussed on the following pages to such cases.

This briefing takes the lessons of history, borrows from its great theorists, and perhaps introduces some original thinking. The objective is to give the reader a better understanding of what challenges lie ahead in the realm of urban operations and how they might successfully be addressed in the interest of serving political and military objectives.
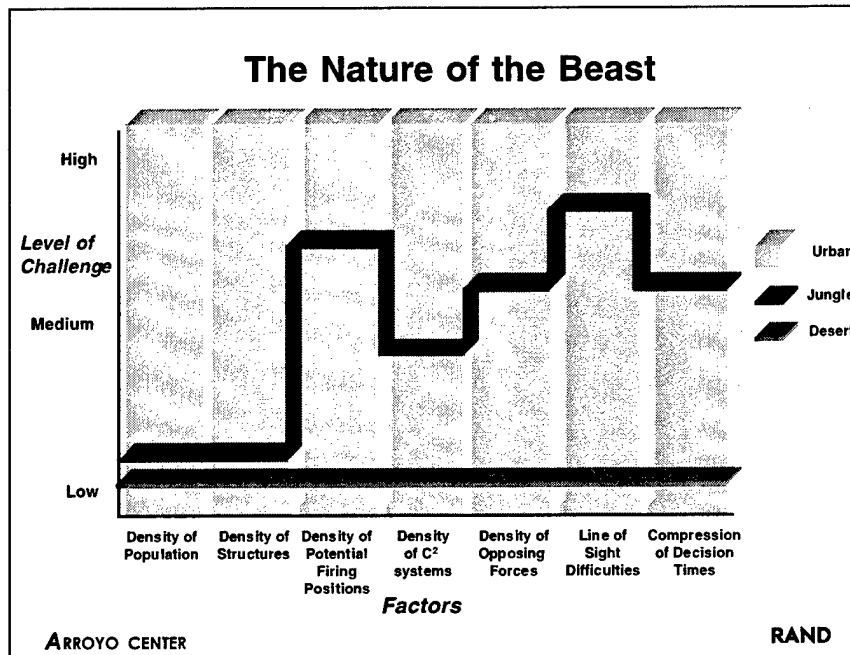
Agenda

- **The Challenges**

- **Thinking About the Challenges**
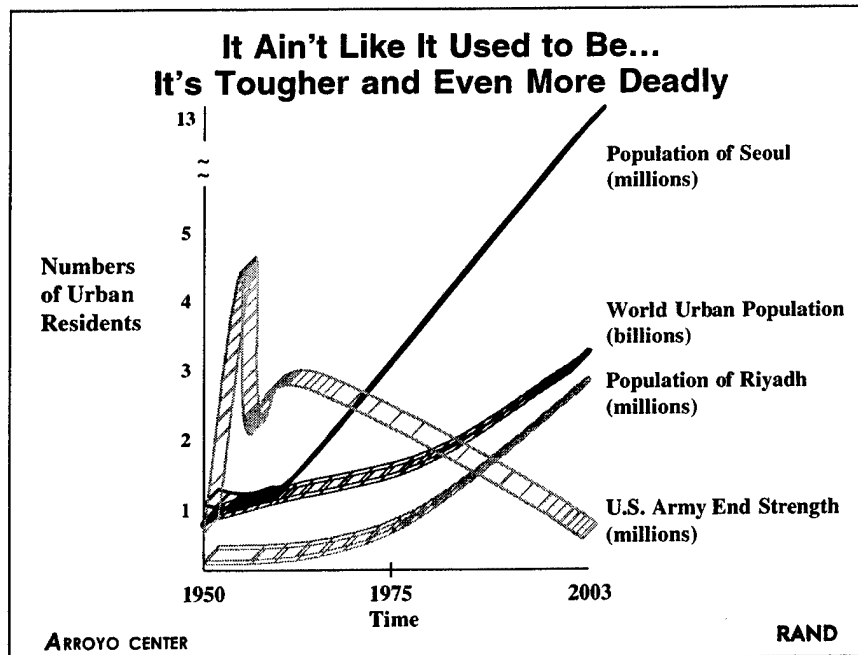 - **Critical Points**
  - **Density**

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The slide illustrates the agenda for the remainder of this study. The initial section considers the nature of military urban operations and the problems they pose. Some readers will have seen some of the material presented in this initial section in other RAND studies.[2] They are invited to forgo the immediately following pages if so desired. It is provided as a foundation for the analysis that follows for all others.

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[2]Among the previous RAND reports that address the conditions and challenges associated with military urban operations are Russell W. Glenn, *Heavy Matter: Urban Operations' Density of Challenges*, Santa Monica, Calif.: RAND, MR-1239-JS/A, 2000; Russell W. Glenn, Randall Steeb, and John Matsumura, *Corralling the Trojan Horse: A Proposal for Improving U.S. Urban Operations Preparedness in the Period 2000–2025*, Santa Monica, Calif.: RAND, DB-322-A, 2001; and Russell W. Glenn, *Combat in Hell: A Consideration of Constrained Urban Warfare*, Santa Monica, Calif.: RAND, MR-780-A/ DARPA, 1996.

The Nature of the Beast

	Density of Population	Density of Structures	Density of Potential Firing Positions	Density of C² systems	Density of Opposing Forces	Line of Sight Difficulties	Compression of Decision Times

Level of Challenge: High, Medium, Low

Legend: Urban, Jungle, Desert

Factors

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Solutions might be far easier to discern were urban operations difficult for but one or two reasons. However, the challenges posed when a military force or civilian agency undertakes missions within a built-up area are varied, large in scale, and replicated nowhere else. Both the density of noncombatants (the number per unit space) and sheer number of innocent civilians across the entire town or city can overwhelm a force. Stringent rules of engagement and a desire to minimize loss of noncombatant life further complicate a unit's efforts at task accomplishment. An adversary has an extraordinary number of potential firing positions from which to choose during urban combat operations, and these may be at, below, or above ground level. Command and control are complicated by severe and repeated interruptions of line-of-sight. Restricted line-of-sight also results in many very-short-range contacts; a rifleman's average engagement range in a city is well under 100 meters. Many such contacts take place at less than 25 meters. Such close-in fighting tends to neutralize many of the advantages that technologically advantaged nations enjoy in other environments. These short ranges and the proximity of units to other friendly force organizations, enemy, and the ubiquitous noncombatants also mean that decision times are often dramatically less than they are anyplace else. The danger of fratricide correspondingly goes up.

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**It Ain't Like It Used to Be...
It's Tougher and Even More Deadly**

A chart titled with "Numbers of Urban Residents" on the vertical axis and "Time" on the horizontal axis (1950, 1975, 2003). Curves are labeled: Population of Seoul (millions); World Urban Population (billions); Population of Riyadh (millions); U.S. Army End Strength (millions).

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The scope of the challenge confronting today's militaries is apparent from this depiction of changes in urbanization and force strength over the last half century. The world urban population increased from less than a billion in 1950 to some three billion in 2000. Riyadh in 1950 was a city of 60,000; fifty years hence its population has grown more than fortyfold, to 2.6 million. In 1950, American soldiers and marines fought for and recaptured Seoul; both the city's population and the end strength of the U.S. Army were approximately one million. Upon the turn of the century the population of Seoul has reached 13 million; the Army numbers roughly 0.5 million men and women.

The implications are multifold. An army having to fight in a modern megalopolis not only confronts the daunting task of defeating an enemy; the tasks associated with the control and support of noncombatants alone can easily demand more manpower than was necessary to seize entire cities in the mid-20th century.

These massive increases in population have been matched by a similar growth in the numbers of vehicles and buildings in built-up areas and in the area covered by modern cities. There are many lessons of value to be taken from historical urban combat. However, the type of urban operations that characterized the World War II seizures of Manila, Aachen, and other urban entities is most likely

simply no longer feasible. Whereas U.S. forces effectively encircled Aachen in 1945, for example, not even history's largest coalition of forces could encircle and isolate many of today's metropolises, much less have sufficient strength remaining to conduct extensive operations within them. They would instead have to take a different approach, perhaps isolating only selected portions of the built-up area. In short, increased world urbanization means that in many cases new concepts are called for.

The Modern City:
More People, More Buildings, More Streets, More Vehicles, More Interest Groups,
More Influence, More Media, More Crime, More Volume, More Requirements . . .
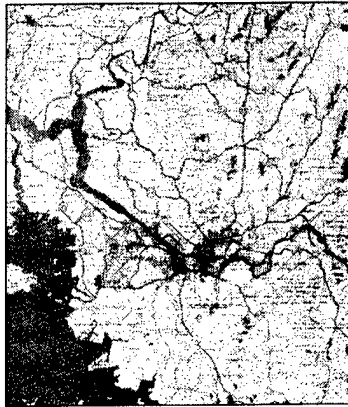
Seoul, 1953   Seoul, 1996

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The challenges confronting military and civilian agency planners and
operators have dramatically increased in complexity and scope over
the half-century-plus since World War II and the Korean War. Seoul
provides an example of the sorts of changes now found virtually
worldwide. As already noted, in the early 1950s it was a city of
roughly one million residents, an urban island separated from other
major conglomerations on the Korean peninsula as shown above on
the left. Today the metropolitan area of Seoul reaches toward and
touches Inchon in the west, Suwon to the south, and Munsan,
Uijongbu, and Tongduchan in the north. Its population climbs
toward fifteen million or more. The area it covers has exploded as
well. Similar expansions in the numbers of buildings, vehicles,
avenues of approach, and other urban-related phenomena have also
taken place. The two-dimensional images above can only begin to
depict the challenges. Much of this growth has been vertical, taking
place below ground or via high-rise buildings. Volume, not area, is
the more pertinent spatial measure during urban operations.

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Military Victory = Strategic Loss?

Battle	Noncombatant KIA	U.S. KIA	Noncom: Friendly KIA Ratio
Manila (1945)	100,000 (est.)	1,010	100:1
Hue (1968)	5,800	150	11:1 (incl. 400 ARVN KIA)
Panama (1989)	202	26	8:1
Mogadishu (1993)	500+	18	30:1

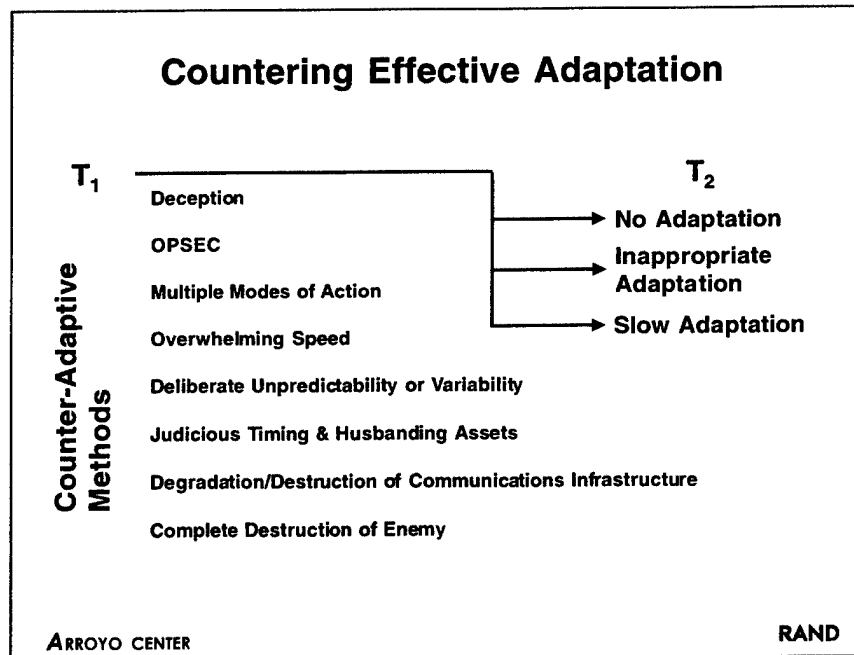The traditional definition of operational success may no longer apply. Instead:

Success = Achieving the Military Objective + Acceptable Friendly Casualties + Tolerable Noncombatant Casualties

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The potential for high numbers of both friendly force and noncombatant casualties adds further challenges to urban contingencies involving combat   The four examples cited above all entailed commitment of American ground forces to close combat. The figures associated with each undertaking are notable for several reasons. First, the numbers represent only those killed. Actual casualties (which would include wounded who did not die) are therefore considerably higher. Second, the numbers are quite high despite their recording only those killed due to the urban military operations; such actions are often very casualty intensive. Even in the case of Mogadishu, the contingency showing the lowest number killed, casualties as a percentage of the U.S. force that was committed to the action were strikingly high. (Seventy-three soldiers were wounded in addition to the eighteen who lost their lives.) Third, the reader will note that it is the noncombatants who suffer the most in the way of casualties during operations in densely populated built-up areas.

Minimizing the exposure of friendly force soldiers and noncombatants to lethal fire is therefore highly desirable. Ways to applying such force selectively (rather than throughout an urban area) and with increased effectiveness are highly desirable. The concepts proposed in the following pages seek to reduce both the extent of the space over which urban combat is waged and, resultantly, the duration of time needed to accomplish a military objective.

Countering Effective Adaptation

T_1

Counter-Adaptive Methods

- Deception
- OPSEC
- Multiple Modes of Action
- Overwhelming Speed
- Deliberate Unpredictability or Variability
- Judicious Timing & Husbanding Assets
- Degradation/Destruction of Communications Infrastructure
- Complete Destruction of Enemy

T_2

- No Adaptation
- Inappropriate Adaptation
- Slow Adaptation

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The close proximity and increased densities of forces and noncombatants in urban areas means that there is more opportunity for someone to observe tactics, techniques, and procedures (TTP) and pass them on to other interested (but not necessarily friendly) parties. Adaptation to an adversary's TTP can therefore take place at a faster rate during operations in built-up areas. It thus makes sense for the friendly force to do all it can to interfere with the foe's ability to adapt effectively. This can be accomplished by either denying enemy adaptation, causing inappropriate or counterproductive adaptation, or slowing such adjustments to the point that they do not adversely influence friendly force action. The left portion of the chart above lists several ways in which a friendly force can achieve one or more of these objectives. Leaders should undertake actions at time T_1 (those aimed at adversely affecting a foe's ability to adapt) such that they bring about the desired results shown at some later time T_2. The chart is adapted from work done by Scott Gerwehr of RAND. For further information, see Russell Glenn et al., *Ready for Armageddon: Proceedings of the 2001 RAND Arroyo-Joint ACTD-CETO-USMC Nonlethal and Urban Operations Program Urban Operations Conference*, Santa Monica, CA: RAND Corporation, CF-179-A, 2002, pp. 48–51.

Obviously, that friendly force needs to adapt in a timely fashion itself. Disciplined reporting, effective post-action debriefings, and dissemination of resultant lessons learned and other relevant observations will aid in maintaining the initiative and staying ahead of the adversary's efforts to anticipate or adapt.

Agenda
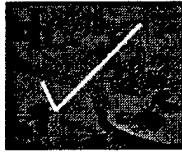
• The Challenges

• **Thinking About the Challenges**
  • **Critical Points**
  • Density

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Having established the nature of the challenges, the remainder of this briefing addresses means of meeting them. The analysis begins with a historical example that demonstrates how a commander, confronted by the vastness and complexity of an urban area, can use the concept of identifying and addressing critical points to better understand and solve the problems that confront him.

Overcoming Urban Complexity:
Cholera in London, 1854

○ : Pump locations

Ⓞ : Broad Street pump location

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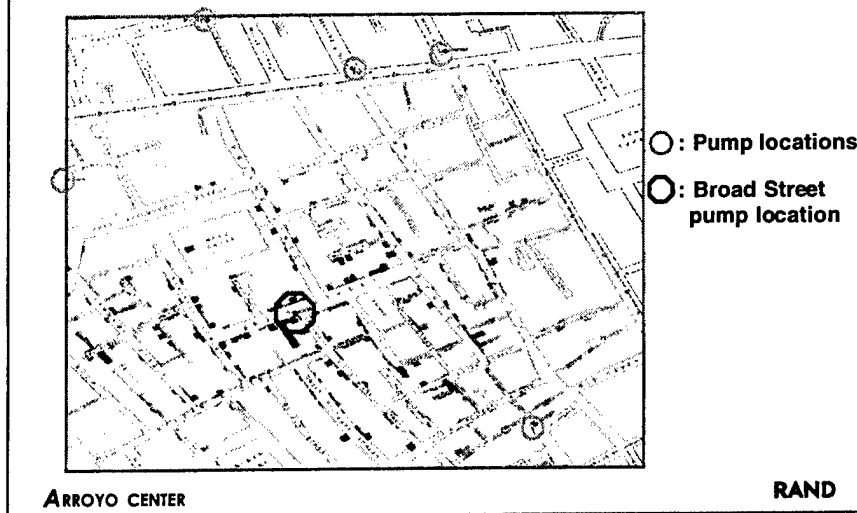
Men, women, and children awoke from a peaceful night's rest and began their day with no thought that it might be their last, or so it was for the first to suffer from the dreadful disease. Seemingly perfectly healthy at dawn, within hours the victims' eyes and cheeks would sink into their faces. Pinching the skin would leave the flesh malformed for too long a time. Diarrhea struck suddenly, so severe that the body could lose a fifth of its weight in a single day. Within twelve hours the disease could kill what a half day before was a carefree child, a loving mother, or the father on whose wages a family's welfare depended. It was 1854 in London, and Asiatic cholera was ravaging the city. Living to see the evening was less taken for granted for those waking in the days after the epidemic took hold.[3]

The cause of the disease and how it was transmitted were poorly understood in the mid-19th century. Many believed it was borne by

[3]This summary of the London cholera epidemic is derived from several sources, to include "Cholera," http://www.biology.lsa.umich.edu/courses/bio18/cholera.htm; G.L. Gilbert, "From Broad St. to Prospect via Milwaukee: Water contamination and human disease," http://www.usyd.edu.au/~cidm/page/inoculum/water.htm; and material from the UCLA John Snow web site, in particular Ralph R. Frerichs, "History, Maps and the Internet: UCLA's John Snow site," http://www.ph.ucla.edu/epi/snow.html. The map is from the UCLA web site: http://www.ph.ucla.edu/epi/snow/snowmap1c_1854.html.

miasma, gases from swamps or decayed organic matter. Others, Dr. John Snow included, thought it was instead caused by an infectious microbe. Snow lived in Soho, an area particularly hard hit by the outbreak. In 1854 the doctor wrote that

the most terrible outbreak of cholera which ever occurred in this kingdom is probably that which took place in Broad Street, Golden Square, and the adjoining streets a few weeks ago. Within two hundred and fifty yards of the spot where Cambridge Street joins Broad Street, there were upwards of five hundred fatal attacks of cholera in ten days . . . . The mortality in this limited area probably equals any that was ever caused in this country, even by the plague, and it was more sudden, as the greater number of cases terminated in a few hours.[4]

Snow realized that most of the Soho cases were people living or working within a part of the neighborhood whose residents used the Broad Street water pump. Of the 89 people who died in the first week of the local outbreak, 79 lived near or regularly acquired water from this source. Snow determined that at least eight of the remaining ten had consumed water from it shortly before they died. Cholera rates were lower in a nearby workhouse that had its own pump and in a local brewery where a considerable number of employees chose to imbibe other liquid refreshment. Dr. Snow took his findings to the Board of Guardians of St. James's parish, the political organization responsible for the area's welfare; the board directed the removal of the Broad Street pump handle the following day. Snow later demonstrated his analysis using the map shown above. Each dash (some so densely packed as to appear solid columns) represents a cholera death at that address. The clustering around the Broad Street pump is obvious.
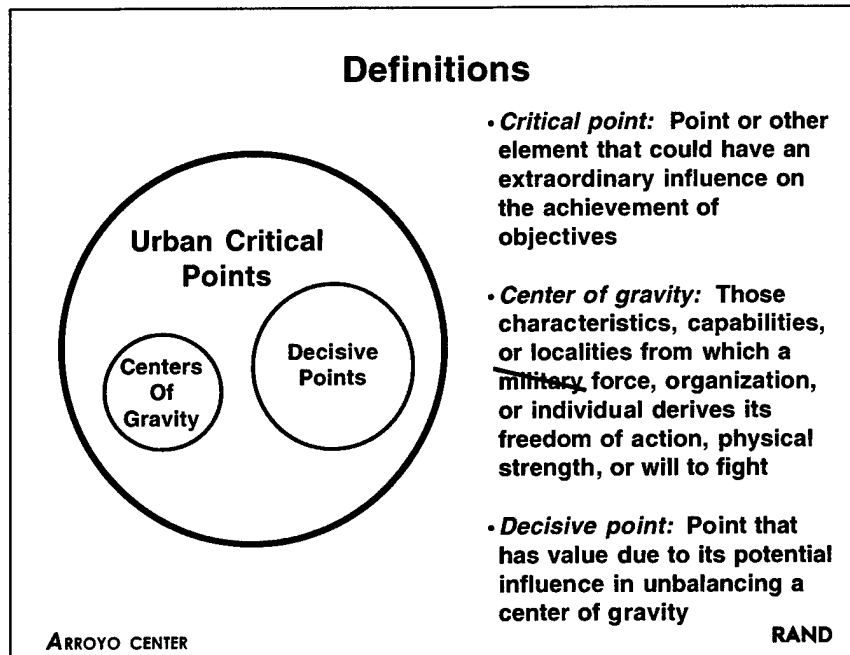
It is not possible to definitively credit Dr. Snow's efforts with the subsequent reduction of Soho deaths due to Asian cholera. The number of fatalities was declining even before the removal of the handle, in no small part because three-quarters of the area's residents had by that time fled the neighborhood. Nevertheless, substantial evidence points to his having determined the source of the problem; his actions were likely significant in mitigating the disaster's effects.

They were also influential in drawing attention to other epidemic-related work that the doctor was performing during the same period.

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[4]Frerichs, "History, Maps and the Internet: UCLA's John Snow site," p. 4.

Snow studied the number of cholera deaths in a population of 300,000 Londoners served by two water suppliers: (1) the Lambeth Company and (2) the Southwark and Vauxhall Company. Those residents supplied by the Lambeth Company, which collected its water upriver of London and thereby provided a product nearly free of the city's sewage and other contaminants, had a rate of cholera deaths one-tenth of that among those whose water came from the Southwark and Vauxhall Company. The latter enterprise drew its water from the River Thames within the city limits.

Snow understood the importance of collecting relevant information regarding London's natural terrain (river), population (numbers of cholera cases), and infrastructure (water supply companies and pumps) in finding solutions to the challenges that confronted him. His study of victim density and later visual presentation of the data backing his Broad Street analysis demonstrate that he identified the points most important to finding a solution. Today's analysts will need the same kind of thinking when confronting urban challenges worldwide.

Definitions

- *Critical point:* Point or other element that could have an extraordinary influence on the achievement of objectives

- *Center of gravity:* Those characteristics, capabilities, or localities from which a military force, organization, or individual derives its freedom of action, physical strength, or will to fight

- *Decisive point:* Point that has value due to its potential influence in unbalancing a center of gravity

Urban Critical Points

Centers Of Gravity

Decisive Points

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Dr. Snow determined the point in urban Soho that was responsible for his neighbors' deaths. The same kind of analysis gives today's commanders a way to avoid being overwhelmed by the vastness of modern urban areas. Critical points (those "points or other elements that could have an extraordinary influence on the achievement of objectives") include key and decisive terrain and analogous components of the enemy force and noncombatant population. They can be applicable to the mission immediately at hand or to the missions yet to come. There is thus a chronological element to their definition. A point of little consequence during current operations might still require identification due to

- likely branches or sequels to the current mission,

- expectations of other future changes of mission,

- value to post-operation activities, e.g., those conducted by the force, organization, or government that will eventually assume responsibility for the area of operations.

Critical points include all terrain, population groups, or other environmental factors that could substantially influence current or future mission accomplishment. Centers of gravity ("those characteristics, capabilities, or localities from which a force, organization, or individual derives its freedom of action, physical

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strength, or will to fight") and decisive points ("points that have value due to their potential influence in unbalancing a center of gravity") are subsets of critical points that possess additional properties of importance to planners and those that must execute assigned missions.[5]

The identification of friendly force centers of gravity, decisive points, and critical points is also an essential part of good analysis (as is their identification for pertinent noncombatant groups). Such identification will have significant implications for force protection; it will also be of value for the development of friendly and enemy courses of action to be used during the wargaming portion of the decisionmaking process.

Note that the concept of critical points is not currently a formal part of U.S. military doctrine. Decisive points have only recently been introduced to U.S. Army doctrine (unfortunately the concept is inadequate, as the following slide addresses). The nature of urban operations is such that planners and executors might well find it beneficial to expand or revise doctrine. By doing so, they will perhaps be better able to consider all mission-relevant factors as they prepare for actions in built-up areas.

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[5]The definition of center of gravity is adapted from *Department of Defense Dictionary of Military and Associated Terms*, Washington, D.C.: The Joint Chiefs of Staff, Joint Pub 1-02, March 23, 1994, as amended through April 6, 1999, p. 70. The definitions of critical and decisive points are the author's own.

Dr. James Schneider at the U.S. Army's School of Advanced Military Studies provided the following way of envisioning the relationship between centers of gravity and decisive points. Consider the center of gravity as a very well constructed wall that one cannot topple despite their best efforts to push it over. The decisive points are akin to the footers or abutments that respectively support or brace the wall. By damaging or removing one or more of these items, the wall collapses, i.e., the center of gravity falls via attacks on its decisive points.

The current U.S. Army doctrinal definition for decisive point fails to address the needs of the field in several ways.[6] First, it appears to rule out the possibility that a person, group, or relationship between individuals or groups could qualify as do places, events, systems, or functions. Second, it is too closely related to the definition of "key terrain" (at least when considered in terms of "a geographic place") to merit separate definition. Third, it only has relevance in conjunction with an enemy. There can, given the definition, be no decisive points in support or stability operations that do not involve an adversary or during combat in situations when an enemy is not involved (e.g., when attempting to re-establish government through civil initiatives). Fourth, it applies only to attacks. The definition precludes its application to noncombat activities or in combat when the operation is other than an offensive one. Finally, it leaves a gap in that the keys to unbalancing a center of gravity other than by direct assault remain unidentified doctrinally.

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[6]The definition of decisive point is from FM 1-02, *Operational Terms and Graphics*, p. 61.

Urban Critical Points—Selected Examples

Traditional critical points:

- Command and control
- Reserve forces
- Firepower concentrations
- Key intersections
- High ground
- Selected low-density capabilities
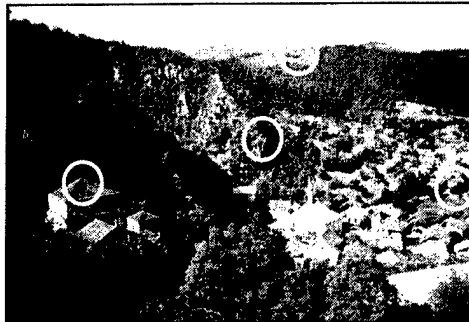
Urban critical points:

- Any of the traditional ones
- Concentrations of noncombatants
- Low-density support assets, e.g., hospitals, power plants
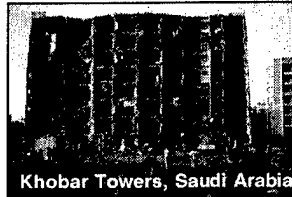- Influential civil authorities
- Potable water

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Samples of what could be critical points appear above. Most are probably familiar to the reader; the concept of identifying notably important pieces of terrain, enemy capabilities, or the like has existed since the beginnings of warfare. Urban critical points might include any of these traditional critical points, but they probably also include many others. Additional points might encompass key infrastructure nodes, influential segments of the noncombatant population, media concentrations, or selected features from areas around the urban area itself.

Two additional elements should be apparent as one considers this slide. First, a critical point can itself be a rather complex and multifaceted entity. If mission requirements are such that a hospital merits designation as a critical point during a support operation, for example, one must realize that keeping the facility operating involves more than just the structure itself. The building is virtually useless without the equipment therein, medical supplies, power, water, and its human infrastructure (doctors, nurses, and support staff). In other words, the critical point is part of a larger system. It also shares components with other systems. The second- and higher-order effects of U.S. military actions on individual critical points or related systems can be dramatic. Denying an urban area electricity, for example, could cause hospitals to rely on back-up generators for power. Those generators may be useless if petroleum fuel supplies are also targeted.

This point leads directly to the second. Determination and analysis of critical points demands not only identifying the points themselves. It also requires an understanding of the nature of the dependencies and interactions between various critical points both within a given system and between systems.

Centers of gravity and decisive points are themselves critical points, albeit ones with special characteristics that distinguish them from other critical points. All critical points will vary by echelon and within organizations at a given echelon. What is a center of gravity at one echelon may qualify only as a decisive point at another, or it may not even achieve status as a critical point. Likewise, a unit at a given echelon may share all, some, or none of the critical points with another unit at the same level. Here too an element of one type (e.g., center of gravity) might be a critical point of another type in a different organization, should it achieve status as a critical point at all.

Further, what comprises the "working set" of critical points, centers of gravity, and decisive points for an organization can change over time. The implications of this dynamism for the military planner and operator are highly significant. Constant validation or adaptation of critical points will be both essential and a significant burden on military analysts, especially given the high tempo that can characterize urban operations.

Subordinate headquarters' critical point selections must consider and not conflict with those of higher headquarters. Those selections will in many cases be directly related to supporting actions to address the senior commander's center of gravity, decisive points, or other critical points.

As previously mentioned, considerations should not only identify adversary centers of gravity, decisive points, and critical points but also those of the friendly force and various noncombatant groups.

Two Examples

Hue, 1968

- VC/NVA conduct detailed planning to aid in identifying critical points

- Ultimately, NVA failure due to loss of CP outside of the built-up area
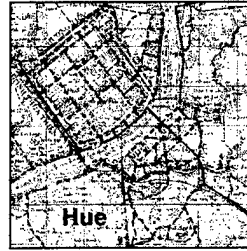
Operation Just Cause (Panama City)

- Critical points selected during planning

- Enemy center of gravity identified: Noriega

- Enemy decisive points: Selected Panamanian Defense Force units

- Other enemy critical points: Key terrain features, e.g., bridges of notable operational importance

- U.S. critical point unrecognized by adversary: American families in Panama

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The above are two illustrative historical examples of how addressing critical points assisted in the conduct of urban operations.

In the case of Hue, the NVA/VC force carefully planned its attack on the highly politically significant target of Hue. Detailed models of the city were constructed prior to the Tet 1968 attack and used to determine objectives for the pending offensive. These critical points included high-visibility political targets, key terrain, and selected personnel, the last often singled out for assassination.[7] The dramatic success of the enemy was in no small part due to the insightful selection of these points. Similarly, the eventual collapse of resistance within Hue was directly related to operations by the U.S. Army's 1st Cavalry Division against the main enemy command post located in a wooded area to the west outside of the city itself, obviously a critical point (whether identified as such beforehand or not).[8]

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[7]For a discussion of North Vietnamese Army and Viet Cong selection of objectives, see Jack Shulimson et al., *U.S. Marines in Vietnam: The Defining Year, 1968*, Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps: For sale by the U.S.G.P.O., Supt. of Docs., 1997, p. 166; and Don Oberdorfer, *Tet!*, New York: Da Capo, 1984, p. 207.

[8]See Shulimson, *U.S. Marines in Vietnam: The Defining Year, 1968*, p. 167; and Eric Hammel, *Fire in the Streets: The Battle for Hue, Tet 1968*, New York: Dell, 1991, pp. 333–334.

The U.S. planning to oust Panamanian leader Manuel Noriega similarly showed cognizance of how important identifying critical points was to success. In this case a good argument can be made that Noriega himself was the adversary center of gravity and that specific concentrations of his Panamanian Defense Force were the decisive points, forces that, when neutralized, would lead to the toppling of their leader (as he would thereafter be without support). Critical points included key bridges essential to cutting off any PDF reinforcement of compatriot units within Panama City proper. Assuming the reverse perspective, the Americans recognized the importance of protecting their servicemen's families stationed in Panama. Had the PDF taken action to threaten them seriously or seize hostages, the outcome of the campaign could have been altered significantly.

The concept of critical points is relevant to domestic U.S. homeland defense applications as well as international contingencies. The 1992 Los Angeles riots help to demonstrate that domestic urban undertakings are no less complex than those overseas. In many ways, the fact that it is U.S. citizens with whom the force is dealing can complicate issues.

During the disturbances that followed the Rodney King court decision, specific areas within the Los Angeles metropolitan area became, for all intents and purposes, anarchical.[9] Containing the unrest, ensuring the safety of the innocent, mitigating damage to property, and subduing the perpetrators required law enforcement, the California Army National Guard, and other agencies to identify the locations and individuals demanding their attentions. These "hot spots" were in some cases already problem areas; others were threatened but initially peaceful. They included terrain (e.g., given neighborhoods or intersections) and segments of the population (particular gangs or parts of given economic groups). "Friendly" critical points had to be identified and protected, as did "neutral" ones. After some early errors, at times related to not identifying critical points, stability was rapidly reestablished. Yet the transition was not flawless.

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[9]For more on the 1992 Los Angeles riots and operations to contain them, see James D. Delk, *Fires and Furies: The L.A. Riots*, Palm Springs, CA.: ETC, 1995.

Civil Nuggets II:
Case Study Los Angeles, 1992

Lessons:

- Lack of familiarity and interagency training led to military-civil disconnects, e.g., military organizations using freeways as unit boundaries, thus ignoring police and fire nodes
- There may be "tiers" of critical points, critical points within critical points (e.g., police stations within a hot spot)
- Second- and higher-order effects can have more immediate and wide-reaching consequences in urban areas
- Primacy of human life can be in tension with containing unrest
  - Urban infrastructure means critical points can have far-reaching influence
  - A terrorist organization is not a federation of gangs. Organizations with greater sophistication may capitalize on social sensitivities to further their ends, e.g., threaten a hospital so as to expose a power station to attack

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One shortfall was the result of the California Army National Guard's unfamiliarity with local service agencies and vice versa. These entities were critical points in their own right given their importance to mission accomplishment. Yet military leaders sometimes moved in and established areas of operations (AOs) without considering the impact of their actions on relationships with local police, fire, and other representative organizations. AOs were delineated using easily identified terrain features (such as highways) much as they would have been in a rural environment. The result was an unnecessary increase in coordination requirements, as these AOs often overlapped large numbers of civil areas of responsibility. Had the military and civil authorities been more familiar with each other, they would have better coordinated so that police precincts, fire districts, and the like were compatible with military divisions of responsibility. Cooperative training is one way to develop such compatibility.

Critical points can be tiered in character, some falling within the geographical bounds or under the influence of others. Further, the aforementioned second- and higher-order effects often have more far-reaching and immediate impact in the close confines of densely populated areas than in more open terrain.

Many lessons can be learned from events such as the 1992 riots. However, considerations regarding homeland defense or terrorist counteractions obviously have to consider a better coordinated, more capable threat than normally exists during civil unrest contingencies.

Agenda
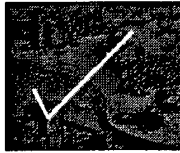
- The Challenges
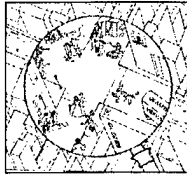
- **Thinking About the Challenges**
  - Critical Points
  - **Density**

The final component of this report considers density as a means of further aiding the understanding and execution of military urban operations.

Critical Points and Density:
A Synergism, Not a Sequence (1)

Density: **The number of elements per unit space or the quantity of activities per unit time**

Density influences CP selection:

- **One hospital in a large city—A critical point**
- **Multiple, redundant hospitals—Perhaps not critical points**

Handling density requires:

- **Insightful planning before the action**
- **Determining second and higher order effects**
- **Rapid adaptation during the action**
- **Monitoring the effects of density on the target throughout**

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Density as used here can be related to space or time. People commonly think of density as the number of some item per unit space. Traffic density is higher when a given stretch of highway has more cars on it; a given volume of downtown that contains many office buildings has a higher density of people during working hours than early in the morning. But density can also apply to the quantity of activities per unit time. A commander whose unit is under attack must synthesize more incoming information per minute as status reports flow in; he will have to correspondingly make more decisions per unit time. Urban areas tend to have higher densities of both types. There are more crimes per unit area in a city than in rural areas on the whole. An urban newspaper stand will have more interactions with customers per unit time than a shop in a small village. These densities offer considerable challenges, but they can also offer benefits to a commander who understands how to capitalize on them.

Density and critical point analyses are complementary. Density will influence what qualifies for designation as a critical point: if there are many of a vital infrastructure asset, that multiplicity may keep that asset from having to be considered a critical point, especially if the multiple assets are redundant. For example, an organization providing support to the residents of a city after a natural disaster

would be unlikely to designate hospitals as critical points if medical facilities were plentiful and fully capable of providing adequate service. On the other hand, were only one or two in working order in a built-up area with thousands in need of medical care, both might well be tabbed as points deserving of special attention.

Understanding density's effects on an operation demands well-considered planning before initiation. Determining the appropriate number and type of units, gauging how centralized or decentralized command and control should be, and estimating how the enemy's capabilities will vary over time are simplified when considered from the perspective of the density of critical elements. An action that will include sweeping through a town's marketplace will require an entirely different mix of forces if that maneuver takes place at night versus during the peak of market time. In the first case the action might require but a few military police to control noncombatants in the area; in the latter their numbers might dominate the task organization. If the operation is in a suburb with widely dispersed buildings, the type of units selected to clear a neighborhood could be quite different than if it were in a city core. The force selection during planning would be different yet again were the buildings widely spaced but characterized by high-rise apartment complexes. Similarly, adaptation to changes in the density of firing positions, noncombatants, and other factors must be made during execution.

**Critical Points and Density:
A Synergism, Not a Sequence (2)**

Critical Point identification decreases the difficulty of comprehending urban complexity; *density* analysis provides a means of managing remaining complexity.

Critical Points

Density

Density within Critical Points

Application of Capabilities
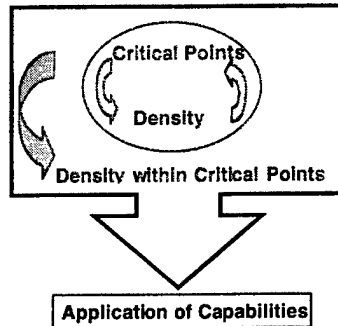
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As noted, density assists in selecting critical points. Critical point identification in turn assists in reducing complexity during a commander's planning and execution processes by limiting the scope of what he has to consider in detail. Density then further helps by providing a means of managing challenges at or within critical points. Together the two abet wise decisions in determining the quantity and character of resources applied to influence selected critical points in the service of mission accomplishment.

There are several ways that a force might deal with the densities it will inevitably confront during urban operations. They have application to both actions involving combat and others that do not. Tactical combat and medical examples are provided in each instance for demonstrative purposes. The concept applies equally well to myriad other types of undertakings:[10]

- **Match density with density.** Neutralize the effects of selected densities by increasing the size of the force or other resources dedicated to the mission. An attacking unit might augment its strength so that it has sufficient men to cover every possible enemy firing position and approach route. Sending large numbers of medical personnel to assist with injuries after a natural catastrophe would match needs and requirements. "Match" does not necessarily imply a one-to-one correspondence. An attacking force could employ several times the number of defenders as it initiates its operation in order to achieve overmatch.

- **Effectively reduce densities.** Take actions that have the effect of reducing the density of selected factors. The number of enemy

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[10]Descriptions and examples are taken from Russell W. Glenn, *Heavy Matter: Urban Operations' Density of Challenges*, Santa Monica, Calif.: RAND, MR-1239-JS/A, 2000, which provides a considerably expanded discussion of density and its influence on urban operations.

firing positions that could threaten a friendly force might be
reduced by maximizing underground and building-to-building
movement to minimize exposure to concentrations of windows,
doorways, and the like; and by employing booby traps,
chemicals, foam, or other lethal and nonlethal munitions to deny
the adversary use of buildings and access to flanks. An attacking
force might maneuver around an urban conglomeration,
attacking into it from a point that avoids the greatest massings of
enemy positions and to the extent possible eliminates the need to
grind through block after block of resistance. The use of
antibiotics could be employed in conjunction with a civil
preventive medicine information campaign to reduce the
numbers that would otherwise suffer from an epidemic.

- **Maintain selected densities.** Denying an enemy reinforcements
  and resupply has often foretold the beginning of the end for an
  urban defender. Zhukov defeated Manstein's efforts to reinforce
  or relieve Paulus's Sixth Army in Stalingrad; only then did
  Paulus surrender his command. Successful isolation means that
  an enemy can at best temporarily maintain his existent level of
  combat capability. An obvious medical parallel is the use of
  quarantine.

- **Address density asymmetrically.** Densities need not be dealt
  with head-on. A commander planning an attack would likely
  desire to minimize the threat of noncombatant interference with
  his operation and the possibility that large numbers of innocents
  could be inadvertently killed or injured. By using PSYOP and
  civil affairs resources, a unit might announce that food, water, or
  other aid is going to be distributed at designated locations and at
  times chosen to draw noncombatants away from the objective of
  a pending attack. The result would be a reduction in the density
  of civilians in the area of concern. Ensuring supplies of fresh
  water, use of immunizations, and education programs are
  medical parallels that would help to reduce the numbers
  suffering from disease in an urban area.

- **Capitalize on urban densities.** Turning disadvantage to
  advantage is a signature characteristic of the best military artists.
  This is no less true during urban operations. The density or
  ambient "hum" of activity in a city is a natural cloak for
  surreptitious actions. Changes in routine are less likely to be

noticed, as urban routine is itself often in constant flux. Density can provide the innovative commander with flexibility. A force moving along a street can divide to go in three directions at an intersection, puzzling an enemy attempting to determine intent, only to use many other routes to reconsolidate at a designated time and location. Similarly, the high volume of electronic signatures, human and vehicle movement, and other activities can be used to either mask intentions or overload an adversary's analysis capabilities. The density of individuals means that disseminating critical medical guidance or introducing prophylactic measures such as chlorinating water can have more immediate effect. Should a commander find that his unit's actions will punch through this ambient level of activity (and thereby attract undesirable attention that could threaten mission accomplishment), he might deliberately cause a disturbance elsewhere to draw an enemy's attention and resources (e.g., creating a smoke-intensive fire in another part of the city).

The Influence of Urban Density I: Case Study Vukovar, 1991
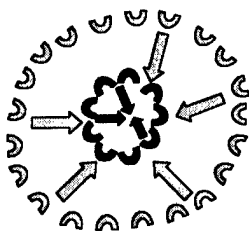
Serb attackers fail to plan for effects of:
- Their own increasing force density
- Their adversary's similarly increasing force density

Result:
- Serb forces interfere with each other
- Croatian counterattacks become more effective as Serbs advance

Lessons:
- Both attackers and defenders should plan for consequences of changing force densities
- Commanders should cull forces so as to provide reserve or units for commitment elsewhere
- Defenders may be able to form counterattack forces as perimeter shrinks

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The case of Vukovar offers an interesting study of how densities can directly influence military urban operations and how understanding its effects can increase a force's efficiency and effectiveness. Serbian forces assaulted Vukovar as part of a larger offensive to force Croatia to rejoin Yugoslavia after the former's declaration of independence. It was an operation that ultimately failed in considerable part due to the time lost and forces committed to the seizure of the city.[11]

Serb forces eventually surrounded the defending Croatians in the city. The Serbs suffered two density-related consequences as they continued their attacks and reduced their adversary's perimeter. First, their own forces, with a shrinking perimeter to attack, started impeding each others' efforts. Second, the Croatians initiated a series of notably more effective counterattacks. Neither should have been a surprise. The expected reductions in attacker and defender perimeters meant that the Serbs should have planned to cull elements out of their forces as they progressed, using them perhaps as a reserve or dedicating them elsewhere to serve the objectives of their campaign. A smaller perimeter to defend meant that the

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[11]For further information on fighting for Vukovar, see *Balkan Battlegrounds: A Military History of the Yugoslav Conflict, 1991–1995*, Washington, D.C.: U.S. Central Intelligence Agency, 2000.

Croatians could similarly remove forces from their forward defensive lines, thereby creating counterattack forces for which they previously lacked the force strength.

Adjustments for density will include those that are this straightforward and others more challenging. For example, an attacking commander planning offensive actions that will sequentially take him through a suburban housing area, across a large urban park, and into dense apartment complexes must determine how to adjust his force strengths to meet the demands inherent in the very different densities each type of terrain will present. He will also have to have a greater or lesser number of units prepared to relieve attacking units that become exhausted due to the severe physical and psychological stresses that characterize urban undertakings.

Density undoubtedly had a part to play in identifying critical points during the 1992 Los Angeles riots. Certain facilities were obvious critical points (gun shops and fire stations, for instance); others were of concern more for political or community goodwill reasons than immediate operational ones. In some such cases, individuals asked that their private commercial enterprises be protected by public servants. That particular assets have "double density" magnifies the challenge. Fire stations, for example, had to be guarded when firemen responded to a call. In addition, sniper fire threatened those pubic servants as they worked at emergency locations, making it necessary to provide protection at those sites as well. It is very likely that the density of critical points will be such that their number exceeds the capabilities available to dedicate to them. Leaders might consider reducing this density by eliminating some critical points (e.g., removing weapons from gun shops in threatened areas) so that security assets can focus on fewer nodes rather than being too widely dispersed. Prioritizing the sequence in which critical points should be addressed will assist in determining how to address the density of those that remain.

Agenda

- The Challenges
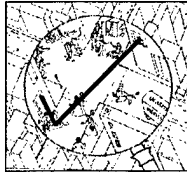
- Thinking About the
  Challenges
  - Critical Points
  - Density

The commander or staff officer standing atop Nam San (mountain) in Seoul, looking out from the observation deck of the Empire State Building, or considering an overhead photographic image of a major urban area can be forgiven for feeling overwhelmed should he receive the mission (training or otherwise) to conduct operations therein. The sheer magnitude of the undertaking, the difficulty of answering even so fundamental a question as "Where do I start?" are natural consequences of facing so large a volume of challenges. This briefing has offered a means of dealing with this elephant by considering its vital parts, the relationships between them, and the inherent characteristics of the beast. By identifying those points critical to accomplishing the missions at hand and employing density as a means of analyzing the character and quantity of capabilities needed to succeed, the animal can be better understood. It is a first step toward its taming.

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